**iEEG Study Description**

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**Overview**

First, participants complete the Perceptual Threshold Task (PTT) to extract the contrast levels that is each participant’s threshold for perceiving a fearful face (FF) and a neutral face (NF); two contrast levels are derived, one for each type of face image. Then, participants complete the Cued Probability Emotion Detection with feedback (CPED\_feedback) task, wherein they are presented with either a FF or NF, at the contrast levels derived from PTT, in each trial. Top-down attention is manipulated as participants are directed to make either a fear-related or neutral-related decision. The participant’s task is to identify whether the face image’s emotion is congruent or incongruent to the type of block (fearful- or neutral- block) by making a yes/no response; feedback is provided on whether the response was correct. Notably, such an “A vs ~A” design engages anticipatory mechanisms, prompting participants to use a fixed mental template against which to examine whether the sensory data matches the template. In addition to being cued to adopt a fearful or neutral template, participants are also cued about the probability of the emotion of the face image being congruent with the block-type. Specifically, participants are cued with a yellow or white box that indicates an 85% or 50% chance, respectively, of the participant seeing FF in a fearful-block and NF in a neutral-block. The experiment is conducted in Chinese.

**Stimuli (for PTT and CPED\_feedback)**

5 Asian male FF, 5 Asian male NF, 5 Asian female FF, 5 Asian female NF, from the HKU Face Database dataset were processed through the SHINE toolbox in MATLAB, using the lumMatch algorithm to equalize low-level physical properties such as luminance and contrast. 4 mask images were created by averaging 4 (2 FF, 2 NF) randomly selected faces, segmenting them into 100 pixels and randomly reorganizing the pixels. These masks were also equalized for contrast and luminance.

**PTT Description**

The task comprises of 10 blocks of 20 trials. Each trial starts with a fixation cross jittered between 2000-6000 ms, followed by a perceptually degraded FF or NF for 100 ms, followed by a mask image for 300 ms. The participant was to identify whether the face was fearful or neutral by pressing ‘N’ for FF and ‘J’ for NF. The face images presented were perceptually degraded by manipulating the contrast level on a scale ranging from 100% to 0%, wherein 100% corresponds to no contrast degradation and 0% corresponds to complete removal of contrast, leaving the image as a grey square. FF and NF images were initially presented at a reduced contrast level at 10%, making images visible, but not easy to see. Adaptive staircasing was used in subsequent trials to obtain the thresholds. The visual perceptual contrast threshold is defined as 75% accuracy (Summerfield et al., 2006). Two perceptual contrast thresholds are obtained for each participant, one for FF and one for NF.

**CPED\_feedback Task Description**

*Blocks and Conditions.* There are 6 blocks, with each block presenting cueing participants to adopt a fearful or neutral perceptual set through the instructions presented – i.e. identify whether the face image stimuli are fearful or not fearful (fear-block; F) or neutral or not neutral (neutral-block; N). The 6 blocks will be counterbalanced between participants such that even-numbered participants are presented with FNFNFN whereas odd-numbered participants are presented with NFNFNF.

*Trials.* Each block is comprised of 20 trials, thus there are 120 trials. Note that the screen refresh rate is 60Hz, so the cues and stimuli have been coded to be presented in accordance with the screen refresh rate. First, participants are presented with a fixation cross, jittered between 60-180 frames (1-3 seconds). Then, they are presented with a cue, for 90 frames (1.5 seconds), regarding the probability of fearful/neutral face image stimulus being presented: 50% or 80%. Then, a (forward) mask image is displayed for 18 frames (0.3 seconds), followed by the stimulus presentation (either an FF or NF) for 6 frames (0.1 seconds), followed by another (backward) mask image presented for 18 frames (0.3 seconds). The face image stimuli and mask images are presented at a 0.2 opacity level. Note that no more than 3 consecutive trials are with the same cue (re: 50% or 80%) and no more than 3 consecutive trials are with the same face emotions (re: fearful face images or neutral face images). All stimuli are presented equal number of times across the whole experiment. Currently, the time per trial is ~10s/trial, therefore the experiment only takes around 20 minutes to complete. Note that there are two practice blocks (FN) before the actual experiment begins, which comprises of one “50%” cue and one “80%” cue each.

According to the block-type, the participant is to identify whether the face image stimulus they saw was fearful or not, or neutral or not. Participants press the left arrow key for “Yes” and right arrow key for “No”. The response must be made using the participant’s dominant hand. There is unlimited time for the participant to make a response. Feedback is provided after 30 frames (0.5 seconds) of the participant making a response, for 90 frames (1.5 seconds). The feedback will be a green coloured “+1” or a black coloured “0” depending on whether the answer was correct or not, respectively. The participants are told to gain as many points as possible at the start of the experiment, providing them with incentive to get as many correct responses as possible. The total number of points earned is presented at the end of each block.

